19 FEDERAL REPUBLIC OF GERMANY

12 **PATENT**

10 DE 196 22 588 C1

51 Int.Cl.[3] G01M 3/36

B65B 57/00
B65D 79/02

GERMAN PATENT OFFICE

21 File No. 196 22 588.4-52
22 Appl. date: 06/05/1996

43 Open Date: -
45 Pub. Date of Patent: 01/02/1998

Objections can be raised within 3 months after publication of the issuance

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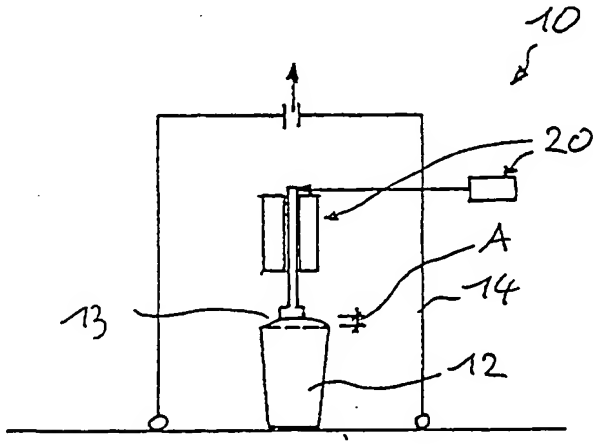
55 Documents taken into account for the assessment of the patentability

[copy]

54 Device for determining the airtightness of filled containers.

57 A process for determining the airtightness of filled containers (12) that at least regionally have a flexible region, in particular a sealed or welded lid (13), in which the region or lid (13) is caused to bulge and this bulge that may be present in the region or lid is recorded by means of a recording device (20) and then evaluated, is characterized by the fact that the containers (12) are brought into a chamber (14) that can be sealed in an essentially airtight manner and then in this chamber (14) an under-pressure or an over-pressure is produced that effectuates the bulging that may be present in the region or lid (13).



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Description

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TECHNICAL AREA

The present invention relates to a device for determining the airtightness of filled containers, that at least regionally have a flexible region, in particular a sealed or welded lid, in which the region or lid are caused to bulge and this bulging that may be present in the region or lid is recorded by means of a recording device and then evaluated, with a chamber that can be sealed in an essentially air-tight manner, means for producing an under-pressure or an over-pressure in the chamber and a recording device for the recording and evaluation of the bulging that may be present in the region or lid.

STATE OF THE ART

A method and a device of the type mentioned is known from DE-OS 35 28 248. Here, in order to determine the airtightness of a filled container, the air- or gas-cushion between the lid and the contents of the container is heated, whereby the resulting increase in volume of air or gas leads to a bulging or a change in position of the lid, or the like. However, with contents from the field of foodstuffs, such as milk and dairy products, particularly yoghurt, cottage cheese dishes and the like, the addition of heat is to be seen as disadvantageous. On one hand, it can damage the product itself, for example due to the fact that whipped cream is caused to collapse, or due to the fact that on use of moderate temperatures (60 degrees Celsius) the undesired growth of microorganisms is favored, and on the other hand due to the fact that on use of higher temperatures the material of the lid can be damaged, since in the known device a heating device must be present in addition to a scanning device, since the displacement or the bulging of the lid is not determined directly but by way of a separate plunger that contains the heating device.

DE 37 18 600 likewise shows a device of the type mentioned at the beginning, in which container-squeezing devices are provided that act on the walls of the container, whereby the respective containers sent to the scanning device are arranged in the container receptacles of a conveyor plate, and the conveyor plate in its scanning position rests on support bridges running in the direction of transportation, that form supports for the container squeezing devices. The increase in pressure occurs exclusively mechanically, whereby however there is a danger that the container walls can be damaged in case of material defects, due to which contamination can occur. Over and above this, multiple containers cannot be checked in their actual packing unit, since the testing occurs on the conveyor plate.

A generic device is described in EP 0277458 A1. In this, a container is brought into a chamber that can be sealed in an essentially airtight manner, and then an under-pressure is produced in this chamber that leads to the bulging that may be present in the region or the lid. The testing thus occurs without mechanical stressing of the walls of the container and without the necessity of supplying heat. Impairment of the contents is thereby excluded. If the under-pressure is produced on the inside of the chamber,

PRESENTATION OF THE INVENTION

The present invention is based on the problem of providing a device for determining the airtightness of filled containers with a recording device, that is simple in construction and assures durable, reliable recording.

The device in accordance with the invention is given by means of the characteristics in claim 1. Advantageous forms and developments are the subject of the subordinate claims.

The device in accordance with the invention is characterized by the fact that there is a longitudinally displaceable plunger shaft supported on bearings with a projecting end region that during recording rests on the region/lid, there is a longitudinally displaceable plunger guide profile that can be stopped in its position during recording, guide bearing units for the plunger guide profile are arranged on a base, between the plunger guide profile and the base there is an annular space, in the annular space there is a flexible hose, and the flexible hose can be impinged on in a one-sided manner by a pressurized medium, in particular pressurized air, due to which the plunger guide profile is stopped in its position.

A particularly preferred form is characterized by the fact that the plunger shaft is supported on the plunger guide profile by way of a spring element. By the provision of a spring the overlooking of small leakages is prevented. That is, if there is pressure with appropriately adjusted spring force on the region or lid, then it can also be established relatively rapidly that a small leakage exists.

Other forms of execution and advantages of the invention are indicated by means of the features listed in the claims and also by means of the execution examples given below. The characteristics in the claims can be combined with each other in any manner, provided they are not obviously mutually exclusive.

BRIEF DESCRIPTION OF THE DRAWING

Forms of execution of the invention are described below in more detail and illustrated by means of the examples shown in the drawings.

Figs. 1 and 2 show a schematic representation of the method for determining the airtightness of filled containers by producing an under-pressure.

Fig. 3 shows a schematic partial cross-sectional representation of the device with a recording device in the initial state; and

Fig. 4 shows a schematic partial representation of the device with a detection device in the testing state.

METHODS OF IMPLEMENTING THE INVENTION

The test method is described in principle using Figs. 1 and 2. First of all, a container 12 with a sealed-on lid 13 is brought into a chamber 14 that represents a component of a device for determining the airtightness of the container 12. The chamber 14 is closed in an airtight manner and, by way of a vacuum pump, not shown in Figs. 1 and 2, an under-pressure is produced inside the chamber 14, after the recording device 20 has recorded the initial position of the lid 13 of the container 12. Due to the resulting under-pressure, the lid 13 bulges as shown schematically in Fig. 2 (measurement A). This displacement is recorded and evaluated by the recording device 20. After the conclusion of the test procedure, the under-pressure is released and the container 12 is brought out of the chamber 14. Containers that are not airtight can then be sorted out with no problem.

The representation in the figures shows testing on one container as an example. In practice, it is possible without problem to provide recording devices with several recording units that are arranged in a grid so that containers that are already arranged in their final packing unit can be tested in one procedure.

In Figs. 3 and 4, an example of an execution of an invention device is shown schematically. Inside the chamber 14, a height-adjustable base plate 18 is arranged by way of a height adjustment shaft 42. The base plate 18 has a continuous recess 19, within which a plunger guide profile 24 is mounted supported on guide bearing units 26 in a longitudinally displaceable manner. In the plunger guide profile 24, a plunger shaft 22 is likewise supported in a longitudinally displaceable manner.

Both the plunger guide profile 24 and the plunger shaft 22 project on both sides over the base plate. In the lower end region of the plunger shaft 22 in Figs. 3 and 4, a pressure plate 36 is mounted. Between the plunger guide profile 24 and the plunger shaft 22, a spring element 38 is arranged that is supported on one side on the pressure plate 36 and on the other side on a spring-centering 44 on the plunger guide profile.

In Figs. 3 and 4, in the upper end region of the plunger guide profile 24 and the plunger shaft 22 there is respectively a stop unit 32 on the plunger shaft 22 and a stop unit 24 on the plunger guide profile 24.

A measuring unit 21 is connected to the stop unit 34, by means of which it is possible to measure or assess the position of the stop 32 of the plunger shaft 22.

In the region between the outer wall of the plunger guide profile 24 and the inner wall of the recess 19 of the base plate 18, an annular space 28 is constructed in which a flexible clamp hose 30 is mounted. The annular space 28 is connected, by way of a channel 46 running in the base plate 18 and a channel 48 connecting to the channel 46 running within the height adjustment shaft 42, with a source of pressurized air, not shown in detail. On passing in pressurized air (arrow P), the clamp hose 30 is compressed so that it rests on the outer wall of the plunger guide profile 24 and thereby the plunger guide profile is stopped in its position.

At the top, a vacuum pump 16 is shown schematically that on actuation of a switch unit 17 produces an under-pressure in the chamber 14. An indicator unit 50 indicates the pressure in each case in the chamber 14. The testing process is now carried out as follows: First, the container 12 is moved under the base plate 18. The base plate 18 and the vacuum chamber 14 are lowered until the pressure plate 36, the plunger shaft 22 and the plunger guide profile 24 have been lifted by ca. 20 mm, which is performed for tolerance compensation purposes. In this state, the chamber 14 is closed in an airtight manner.

Pressurized air (arrow P) is fed in through the height adjustment shaft 42, whereby the clamp hose 30 is pressed on to the plunger guide profile 24 and stops the latter axially. A vacuum valve is opened and evacuates the inside space of the chamber 14 to a preset under-pressure.

The inside pressure in the container 12 presses the lid 13, and thus the pressure plate 36, upwards against the action of the spring element 38. Consequently, the stop 32 of the plunger shaft 22 is likewise shifted upwards, whereby the position of the stop 32 is scanned by the measuring unit 21. If the set pressure is reached, the measuring unit 21 checks whether the stop has reached the specified end position.

If the stop 32 has not achieved the specified displacement path, then the container is not airtight. This can then be indicated by indicator devices in the usual manner.

After the checking procedure, the under-pressure is again released by closing the vacuum valve and opening the chamber 14. By lifting the chamber, the checked container 12 can be transported further, and another test procedure be started after bringing in another container.

It is likewise possible, according to the invention, to produce an over-pressure instead of an under-pressure. Then the lid does not bulge outwards but inwards if an airtight closure is present. This bulging to the inside can likewise be evaluated.

Patent claims

Device for determining the airtightness of filled containers (12), that at least regionally have a flexible region, in particular a sealed or welded lid (13), in which the region or lid (13) is caused to bulge and this bulge of the region or lid (13) that may be present is recorded by means of a recording device and then evaluated, with

- a chamber (14) that can be closed in an essentially airtight manner,
- means for producing an under-pressure or an over-pressure in the chamber (14),
- a recording device for recording and evaluating the bulge in the region or lid (13) that may be present,

characterized by the fact that

- the recording device (20) is so constructed that:

- there is a plunger (22), supported in a longitudinally displaceable manner, with an projecting end region, that during recording rests on the region/lid (13),

- there is a plunger guide profile (24) that is supported in a longitudinally displaceable manner and during recording can be stopped in its position,

- there are guide bearing units (26) for the plunger guide profile mounted on a base (18),

- between the plunger guide profile (24) and the base (18) there is an annular space (28),

- in the annular space (28) there is a flexible clamp hose,

- the clamp hose (30) can be impinged on one side by a pressurized medium, whereby the plunger guide profile (24) is stopped in its position.

2. Device as in claim 1, characterized by the fact that the recording device has several recording units arranged in a grid matrix.

3. Device as in claim 1 and/or 2, characterized by the fact that the plunger shaft (22) is supported on the plunger guide profile (24) by a spring element (38).

4. Device as in one or more of the preceding claims, characterized by the fact that a pressure plate (36) that rests on the region/lid (13) for the recording is mounted on the projecting end region on its face.

5. Device as in one or more of the preceding claims, characterized by the fact that the plunger shaft (22) and/or the plunger guide profile (24) have a stop unit (32, 34) on the other end region.

6. Device as in one or several of the preceding claims, characterized by the fact that the pressurized medium is pressurized air.

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with 3 pages of drawings

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Drawings page 1

Number: DE 196 22 588 C1
Int. Cl.: G 01 M 3/36
Date of publicn: January 2, 1998

Figs 1 - 4

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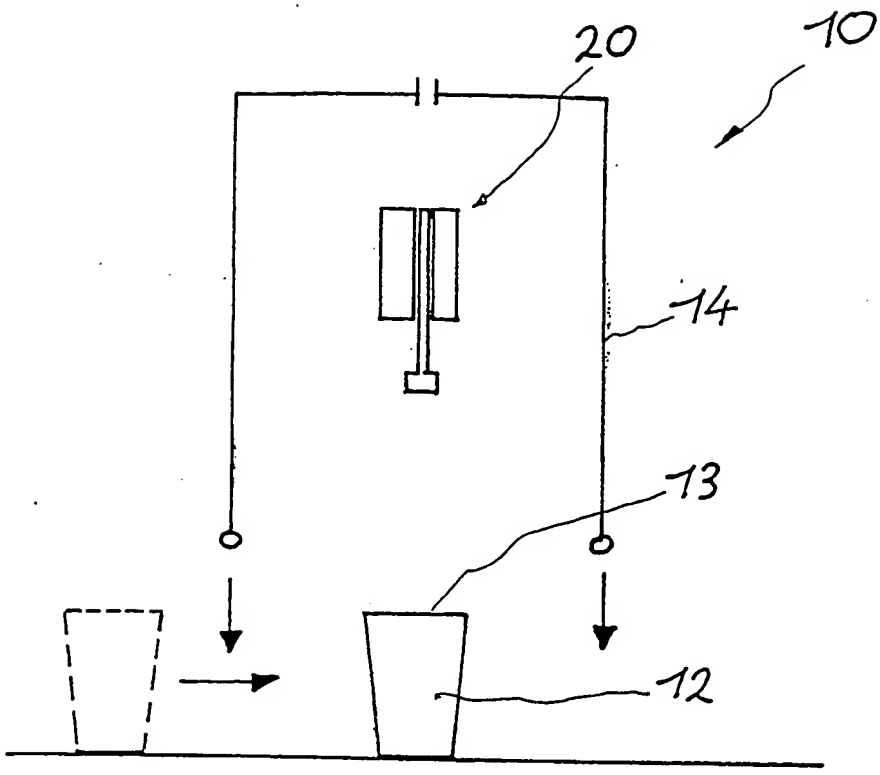

Fig. 1

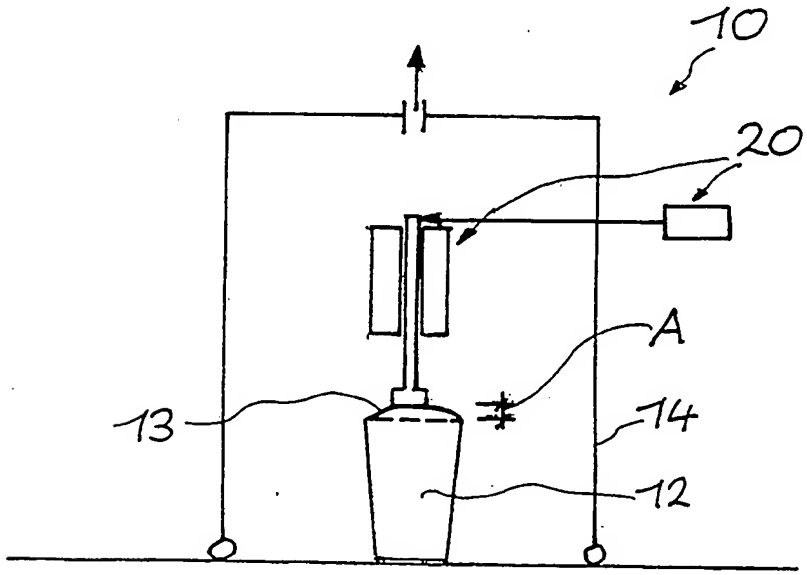

Fig. 2

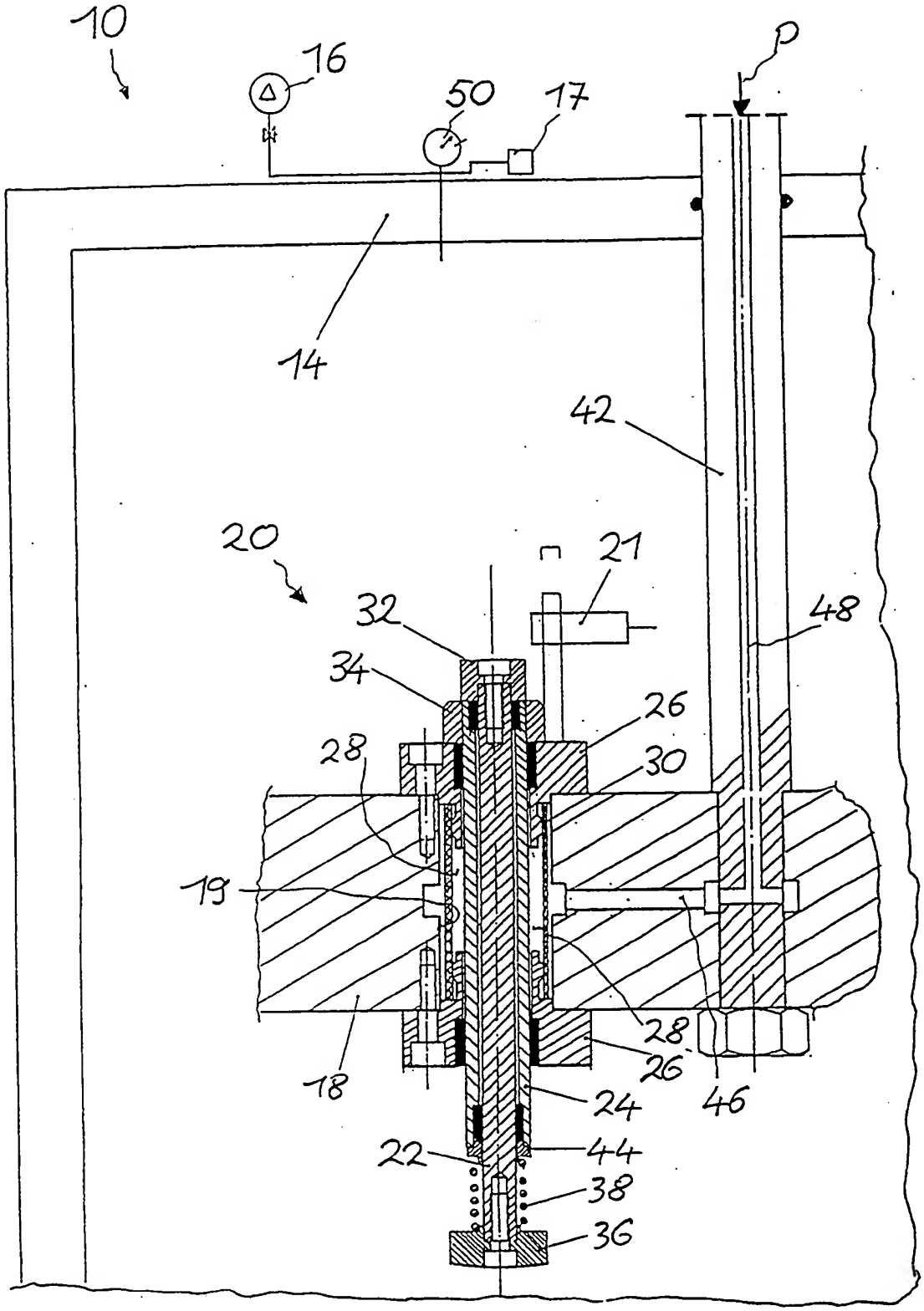

Fig.3

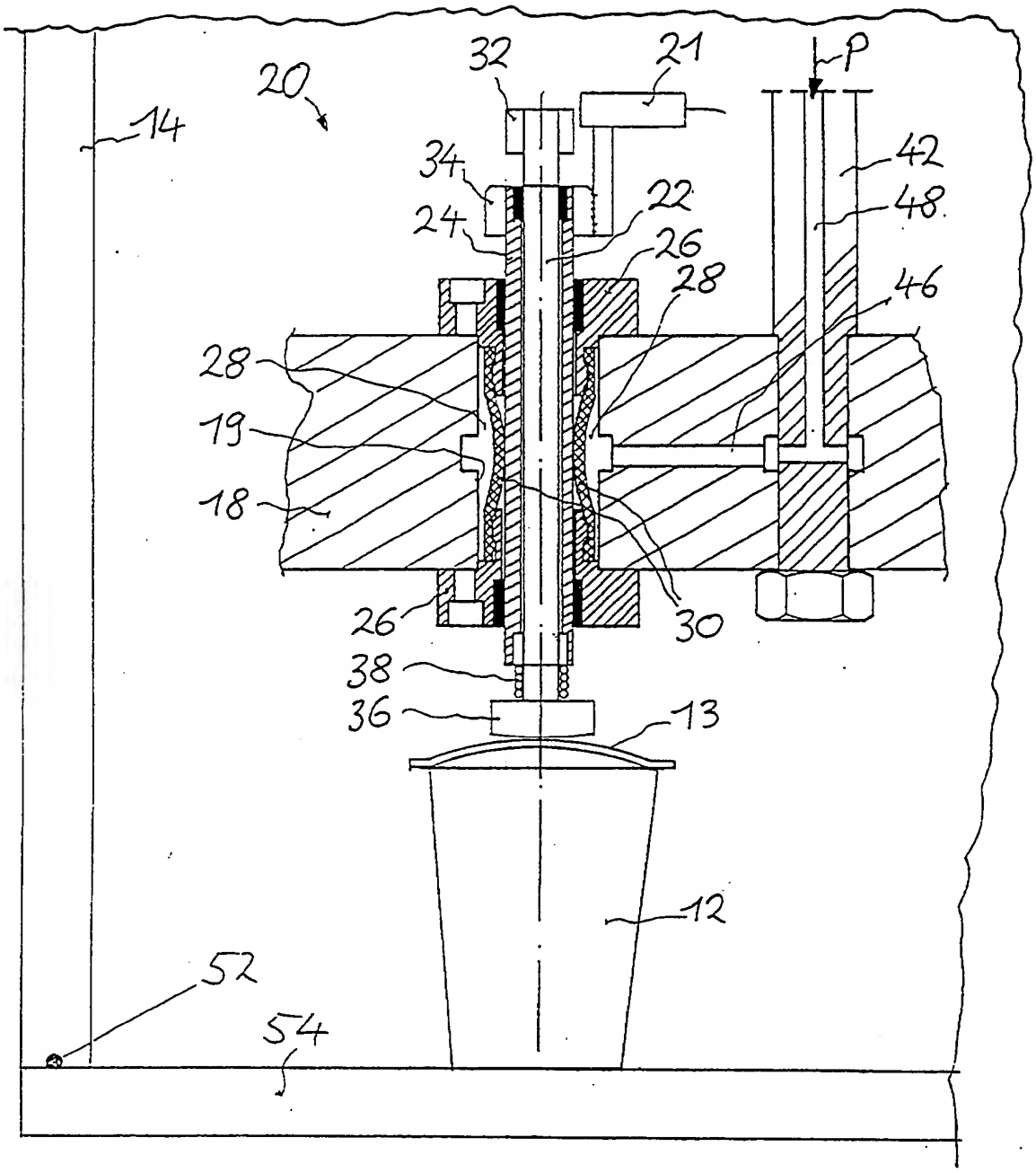

Fig. 4